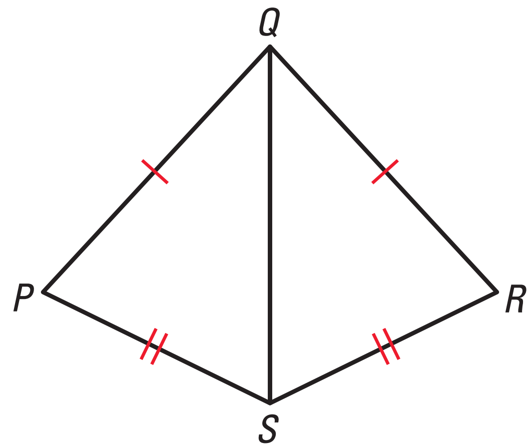
Pre-AP Geometry Date_____ 4.5 Notes
Using Congruent Triangles (pp 229-230)
- **I can prove shapes are congruent.**

Knowing that all pairs of corresponding parts of congruent triangles are congruent can help you reach conclusions about congruent figures.

For instance, suppose you want to prove that $\angle PQS \cong \angle RQS$ in the diagram shown at the right. One way to do this is to show that $\triangle PQS \cong \triangle RQS$ by the SSS Congruence Postulate. Then you can use the fact that corresponding parts of congruent triangles are congruent to conclude that $\angle PQS \cong \angle RQS$.

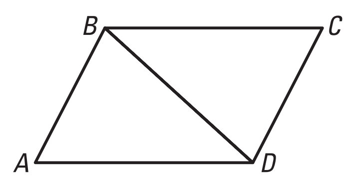


EXAMPLE 1 *Planning and Writing a Proof*

GIVEN ▶ $\overline{AB} \parallel \overline{CD}$, $\overline{BC} \parallel \overline{DA}$

PROVE ▶ $\overline{AB} \cong \overline{CD}$

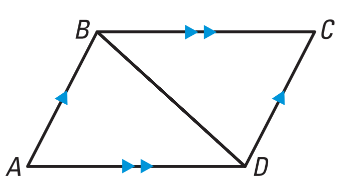
Plan for Proof Show that $\triangle ABD \cong \triangle CDB$. Then use the fact that corresponding parts of congruent triangles are congruent.



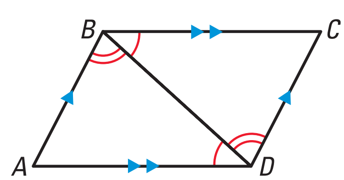
SOLUTION

First copy the diagram and mark it with the given information. Then mark any additional information that you can deduce. Because $\overline{AB}$ and $\overline{CD}$ are parallel segments intersected by a transversal, and $\overline{BC}$ and $\overline{DA}$ are parallel segments intersected by a transversal, you can deduce that two pairs of alternate interior angles are congruent.

Mark given information.



Add deduced information.



Paragraph Proof Because $\overline{AB} \parallel \overline{CD}$, it follows from the Alternate Interior Angles Theorem that $\angle ABD \cong \angle CDB$. For the same reason, $\angle ADB \cong \angle CBD$ because $\overline{BC} \parallel \overline{DA}$. By the Reflexive Property of Congruence, $\overline{BD} \cong \overline{BD}$. You can use the ASA Congruence Postulate to conclude that $\triangle ABD \cong \triangle CDB$. Finally, because corresponding parts of congruent triangles are congruent, it follows that $\overline{AB} \cong \overline{CD}$.

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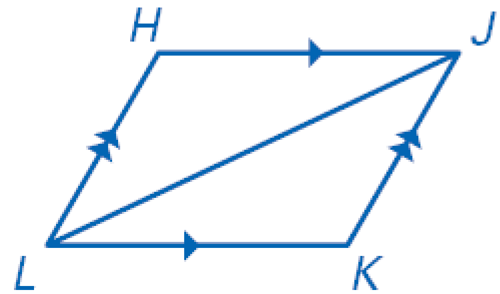
Using Congruent Triangles (pp 229-230)

1. Given: $\overline{HJ} \parallel \overline{LK}$
$\overline{JK} \parallel \overline{HL}$

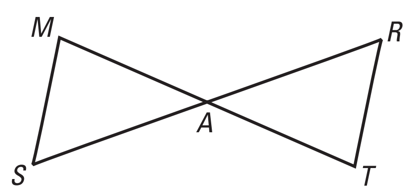
Prove: $\measuredangle LHJ \cong \measuredangle JKL$



EXAMPLE 2 ***Planning and Writing a Proof***

GIVEN ▶ A is the midpoint of $\overline{MT}$,
A is the midpoint of $\overline{SR}$.

PROVE ▶ $\overline{MS} \parallel \overline{TR}$



Plan for Proof Prove that $\triangle MAS \cong \triangle TAR$. Then use the fact that corresponding parts of congruent triangles are congruent to show that $\angle M \cong \angle T$. Because these angles are formed by two segments intersected by a transversal, you can conclude that $\overline{MS} \parallel \overline{TR}$.

Statements	Reasons
1. A is the midpoint of $\overline{MT}$, A is the midpoint of $\overline{SR}$.	**1.** Given
2. $\overline{MA} \cong \overline{TA}$, $\overline{SA} \cong \overline{RA}$	**2.** Definition of midpoint
3. $\angle MAS \cong \angle TAR$	**3.** Vertical Angles Theorem
4. $\triangle MAS \cong \triangle TAR$	**4.** SAS Congruence Postulate
5. $\angle M \cong \angle T$	**5.** Corresp. parts of $\cong$ ⚠ are $\cong$.
6. $\overline{MS} \parallel \overline{TR}$	**6.** Alternate Interior Angles Converse

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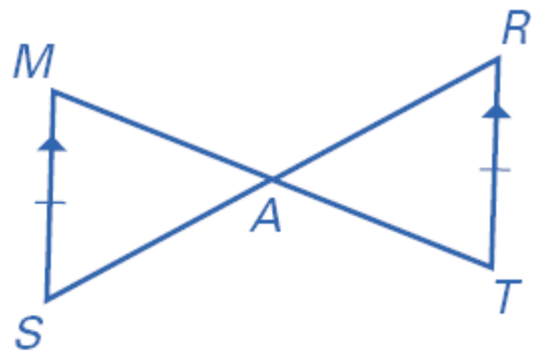
Using Congruent Triangles (pp 229-230)

2. Given: $\overline{MS} \parallel \overline{TR}$
$\overline{MS} \cong \overline{TR}$

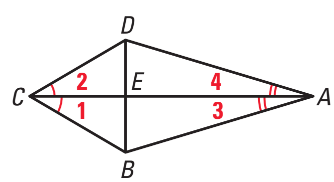
Prove: A is the midpoint of $\overline{MT}$.



EXAMPLE 3 ***Using More than One Pair of Triangles***

GIVEN ▶ $\angle 1 \cong \angle 2$
$\angle 3 \cong \angle 4$

PROVE ▶ $\triangle BCE \cong \triangle DCE$



Plan for Proof The only information you have about $\triangle BCE$ and $\triangle DCE$ is that $\angle 1 \cong \angle 2$ and that $\overline{CE} \cong \overline{CE}$. Notice, however, that sides $\overline{BC}$ and $\overline{DC}$ are also sides of $\triangle ABC$ and $\triangle ADC$. If you can prove that $\triangle ABC \cong \triangle ADC$, you can use the fact that corresponding parts of congruent triangles are congruent to get a third piece of information about $\triangle BCE$ and $\triangle DCE$.

Statements	Reasons
1. $\angle 1 \cong \angle 2$ $\angle 3 \cong \angle 4$	**1.** Given
2. $\overline{AC} \cong \overline{AC}$	**2.** Reflexive Property of Congruence
3. $\triangle ABC \cong \triangle ADC$	**3.** ASA Congruence Postulate
4. $\overline{BC} \cong \overline{DC}$	**4.** Corresp. parts of $\cong$ $\triangle$s are $\cong$.
5. $\overline{CE} \cong \overline{CE}$	**5.** Reflexive Property of Congruence
6. $\triangle BCE \cong \triangle DCE$	**6.** SAS Congruence Postulate

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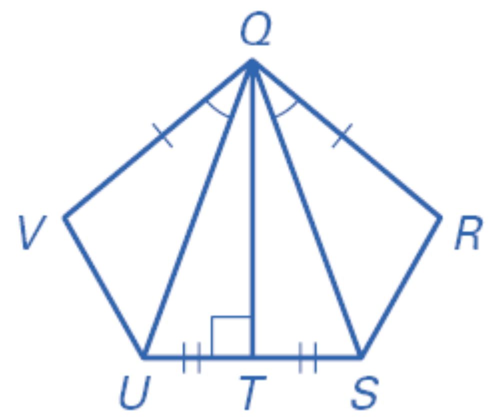
3. Given: $\overline{QT}$ is the $\perp$ bisector of $\overline{US}$.

$\overline{QV} \cong \overline{QR}$

$\measuredangle VQU \cong \measuredangle RQS$

Prove: $\triangle QUV \cong \triangle QSR$



4. Given: $\overline{MP}$ bisects $\measuredangle LMN$

$\overline{LM} \cong \overline{NM}$

Prove: $\overline{LP} \cong \overline{NP}$